# THE 42-CM. MORTAR: FACT AND FANCY

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WHEN in August, 1914, the first shots of Erdmann's battery destroyed the strong forts of Liege; and when one Belgian or French fortress after another, including even the central redoubt of the Belgian army, the "impregnable" fortified camp of Antwerp, fell to our big guns, not only Germany but the whole world was startled. In the old contest between gun and armor, the gun had scored another victory. Even among our German regular officers, 99 per cent. were entirely surprised by the new weapon. Soon after the fall of Liege, postcards began to appear, authorized by Army headquarters, showing conclusively the effect of the projectiles on armor and concrete.

It is not to be wondered at, then, that a mythology grew up about this weapon, which spread rapidly among the people and concealed the truth. The myths begin even at the cradle of the 42-cm. mortar. It is popularly believed that the Krupps were its sole creators; that Friedrich Krupp had built it secretly, hidden it in a closet, and presented it as a great surprise gift to the German Army on mobilization. As a matter of fact, the Great General Staff had formulated the demand for a piece of artillery which could quickly overcome strong armored concrete works; this piece was developed through several years of constant coöperation between the Artillery Test Commission and the Krupps. The work of the firm was of the utmost value, but so was that of the Commission, and particularly that of its president, Sieger. The credit for the second model, adapted for road transport, is especially due to him. More even than in the development of the gun, the influence of the Commission is to be seen in the development of the proper projectiles, explosives and fuses. Great difficulties were encountered in these, and solved largely through the work of Major Arnold, the Foot Artillery projectile expert.

I, myself, as an assistant in ballistics, did some of the preliminary work on range tables in 1911. Experiments were in progress with the gun, carriage and ammunition, for several years before the war, at the Krupp proving grounds at Meppen, at Kummersdorf, Thorn and Jüterbog. Hundreds of men of the Commission's proving ground battery were instructed in the use of this matériel and were discharged. Many of the civil employes of the proving grounds knew all about it. I remember, for example, a visit to the targets,

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when the driver of my motor car pointed out an unexploded 42-cm. shell lying beside the road. It appeared that he knew its weight, its explosive charge, and its initial velocity. In spite of all this, the secret was absolutely kept, both at home and abroad—greatly to the credit of all those connected either with the Krupps or with the Commission, who had to do with the development of the matériel.

All sorts of fables grew up as to the handling of the gun. Early in 1915 a pamphlet was published, in regular catch-penny form, which told the most extraordinary yarns about the "big Bertha." Even serious papers circulated some of these sotries. One of the big Berlin newspapers printed an account of the action of Solf's battery at Fort Manonviller, fairly accurate for the most part, but saying that "the guns were served by elegant gentlemen in cutaway coats," meaning thereby Krupp's engineers. These Krupp engineers filled everyone's imagination; in the summer of 1915, visitors to my battery before Kovno asked where they were. The actual fact is, that the commanders of the first 42-cm. batteries, at mobilization, were captains from the Artillery Test Commission, to whom the matériel was already familiar. Most of the battery officers were of the active army, assistants to the Commission. In a few cases employes of the Krupps were assigned as battery officers, and even as battery commanders; these, however, were not "Krupp engineers," but retired officers employed by Krupp, who had worked with the matériel on the proving grounds. All the men were regular Prussian artillerymen. In the three batteries first organized on mobilization, about one-third of the men were detailed from the active list of the proving ground battery; two-thirds were reservists, who had served in that battery or at the School of Fire. Later in the war, and especially when more batteries were put in the field, this selected material was not available, and there was even less chance of getting "Krupp engineers" for cannoneers.

It seems not out of place to give here some data on the matériel and ammunition, since the fable writers have touched upon these also. I am sure that, in our present situation, I can not be charged with divulging military secrets.

We had at the outbreak of the war two types of 42-cm. mortars. The older type, the "gamma" model, was the heavier, but the better ballistically. Gun and mount, in firing position, weighed 175 tons. For transport it was divided into several parts, to be carried on railway cars. The heaviest load was 26 tons. A special firing spur had to be built from the nearest permanent track. The gun was mounted and dismounted by means of a special portable crane; either operation required about 36 working hours. Adding the time necessary for building the spurs, it will be seen that days or even weeks were required for getting one of these "gamma" batteries into action.

The newer type, the M model, had been much lightened, at the expense of its ballistic efficiency. The weight in firing position was 42.6 tons. It also was separated into several loads for transport, but these were adapted to motor transport, and could make 7 kilometres an hour on good roads, or even sometimes move across country. The heaviest vehicle, loaded, weighed 18 tons. This weight caused difficulties at road bridges and culverts, especially in Russia, but these could always be overcome by means of the bridge balks carried along for use in mounting the piece. These were of metal, U-shaped in cross-section, and so designed that they would carry the weight of the heaviest vehicle when supported only at the ends. In the summer of 1915 I succeeded in crossing stretches of Russian swamp with these. It required only a few hours to set up this piece.

Except for the use of cranes, made necessary by the heavy weights of matériel and ammunition to be handled, there was little difference in the service of the piece as compared with lighter guns. The newer model of 42-cm. mortar is an enlarged copy of the 21-cm. Many stories of the peculiarities of service must therefore be added to the list of fables. It was said that the air pressure was so great when the piece was fired that the gun crew had to take cover and fire by electricity. Other journalists went even farther; the improved story was that after loading and laying, the whole gun crew was carried a kilometre to the rear in motor trucks; one man remained behind, lighted a fuse connected with the powder charge, and then followed on a motorcycle. Of course, there is not a spark of truth in all this. The firing was originally done precisely as with other guns; the shields protected the crew, so that they felt the blast less than others standing near. It was not until 1916 that orders were issued requiring that the piece be fired from cover by means of a long lanyard; and this was not on account of the blast, but because there had been several cases of bursts in the bore.

The ballistic qualities, also, were greatly exaggerated. Ranges as high as 100 kilometres were attributed to "big Bertha." Unfortunately, the actual ranges were very modest—14 kilometres with the railway model, and not much over 9 with the newer gun. The mobility of the latter had been purchased at the cost of 30 per cent. of the range.

The weight of the long projectile for the railway gun was 920 kilograms, or about the same as our old field gun in firing position. For the lighter model, the projectile weighed 800 kilograms. The muzzle energies were respectively 9000 and 4000 metric tons.

Extraordinary acccuracy was attributed to the big mortars. In deflection this was to a certain extent justified; the guns responded accurately to changes of two minutes of arc. In range they showed

much the same dispersion as other guns, and this dispersion increased materially during the war by reason of the wear of the guns and the falling off in quality of ammunition. Precise data as to dispersions were scanty before the war, experimental firing being restricted because of the cost of ammunition and the wear on the guns; but enough had been done to permit plotting a dispersion diagram on transparent cross-section paper. I have used such diagrams to calculate the amount of ammunition needed for any given target. They were issued to the extra-heavy batteries and to higher artillery commanders upon mobilization, but I have never seen them used except in my own battery. If they had been, much ammunition would have been saved, and much disappointment avoided.

It has been very commonly reported that the 42-cm. batteries each had a lighter gun for fire adjustment. This was of course not the case; adjustment was made with the heavy calibre.

As shown by many photographs, the 42-cm. shell was effective against the heaviest armor and concrete of the Belgian forts. As typical of this effect, I recall in particular two hits made by my own battery on the Fort of Wavre St. Catherine, in the outer line of forts of Antwerp, on September 29, 1914. On the evening before, I had fired a few rounds at the fort for adjustment. On the morning of the 29th I fired with the second piece, the more accurate, at the heavy guns in the armored cupolas, while using the first piece against the concrete casemates. The conduct of the fire was a pleasure to an artilleryman, especially in the beginning. Half a minute or a minute after the telephone warning "on the way," the projectile could be heard approaching. "The train is coming," my telephone operator used to say. Now it was time to direct the telescope upon the air just above the target; with a little practice the shell could be picked up in the air and the impact itself observed. On this day, I saw my eleventh shot strike fair upon the top of the cupola, where the enemy's guns were actively firing. There was a quick flash, which we had learned at Kummersdorf to recognize as the impact of steel upon steel. Then an appreciable pause, during which the cupola seemed uninjured; then a great explosion. After a few minutes the smoke began to clear, and in place of the cupola we saw a black hole, from which dense smoke was still pouring. Half the cupola stood upright, 50 metres away; the other half had fallen to the ground. The shell, fitted with a delayed action fuse, had exploded inside. When I visited the fort later, I found a clean round hole in the part of the cupola that had been thrown to one side, punched out by the projectile. The head of the shell was found in the demolished tower, still sharp—a striking testimonial to the excellence of the material and workmanship.

A little later, I got another clean hit on the same fort, which

exploded the magazine. A cloud of smoke shot up a thousand metres; numerous small explosions followed, and the whole fort took fire.

I have mentioned these details, because they concerned my own battery. This bombardment is interesting also because I have a detailed description of it from the other side. The father of one of my cannoneers sent me a copy of the Amsterdam "Algemeen Handelsblad," in which was published a letter from a Belgian artillery officer, who had been in the fort at the time, and who was later wounded at the fall of Antwerp and escaped over the Dutch frontier. It describes very vividly the fearful effect of the German 42-cm. mortars, and gives many details, especially of the effect upon the men of the garrison.

Later on the Belgian forts, especially those of Antwerp, were studied technically by the German engineers. It was found that the surprising effect on concrete work was due to the poor material. A pioneer officer said to me in October, while we were examining one of the captured forts, that the Belgian government had been shamefully defrauded by its contractors. I have not the technical knowledge to form an opinion on this; in any case, the actual effect of the 42-cm. mortars speaks for itself.

It is also said that our 42-cm. shell had little effect upon the French forts, such as Manonviller, Vaux and Douaumont, where good concrete was used. I know personally only Douaumont. This fort was hit only a few times by the 42-cm. shells; so we can not conclude, from the comparatively small amount of damage, that they lacked power. As to the other forts I can offer no opinion.

The shell effect was so great, at the very beginning, that legends soon grew up in regard to this also. Even our own higher commanders were not free from undue optimism, and often assumed that any fort could be demolished with a few shots. When it was not, the poor battery commander was blamed. They were surprised, too, if a work, assaulted after long continued fire, was found to be occupied. For instance, Fort Wavre St. Catherine, whose bombardment has been described above, was not assaulted until two days after the fire had ceased. Patrols then found it occupied; and I promptly heard from General Beseler's headquarters. My battery was turned upon the ruins again; an assault was made as soon as the fire ceased, and the fort was found abandoned. One may readily see, from the pictures of these heaps of ruins, what fine machine-gun nests they make. If the enemy abandons the work during the bombardment, but is given time to reoccupy it before the assault, no amount of destruction will do any good.

The attack on my second target. Fort Koningshoykt at Antwerp, was better managed. I had my observation station in the infantry

outpost line; as soon as I ceased firing, the infantry followed my last shot into the fort, and occupied it without resistance, before the enemy had time to return.

The nature of the 42-cm. mortar and its projectiles make it particularly adapted to deep targets under strong horizontal cover. Through failure to appreciate this, it was often used against every possible or impossible sort of target, as a sort of maid of all work. Then, when it was used, over the protest of the battery commander, and got no effect, everyone was disappointed. I do not object so much to using it sometimes against field targets, when the weapon is still unfamiliar to the enemy, so that the moral effect is very great. Such fire proved well worth while at the crossing of the Danube in the Servian campaign. On this occasion I was on the left flank; my battery fired only five shots. Three of them fell on the commanding Goritza heights, on the south bank, and drove the cannoneers from the Servian guns in position there; the other two fell in the suburb of Ram, on the south bank, with great moral effect.

On the western front it was different. The enemy soon found that the effect upon shallow targets was mostly moral. I was called upon to fire for weeks upon shelter trenches, and only a few rounds a day were allotted. That this was sheer waste of ammunition I pointed out again and again, but without success; everyone swore by the moral effect, and was greatly disappointed when the poor results justified my protests. Hundreds of rounds were thrown away in firing upon cities and villages, such as Nieuport, Ypres and Dixmude. The 42-cm. shell weighs as much as eight 21-cm., and the eight give vastly more effect than the one against such targets.

The worst case of failure to appreciate the characteristics of the 42-cm. matériel was in February, 1915, when it was proposed to use my battery against English armored ships, which were annoying our right flank in Flanders. One need not be a coast artilleryman to see the uselessness of this. This time, fortunately, my protest had its effect, when backed by the opinion of the chief munitions officer. But I got other extraordinary targets, little less suitable. In Nieuport, a little place on the coast west of Ostend, which was then just behind the enemy's line, there is the so-called Templars' Tower, built in the middle ages, with thick, heavy walls, and giving fine observation over the low Flemish country. There was an old saying that the town was impregnable so long as the tower stood. I was ordered to demolish it. Now at that range my mortars had an angle of fall of almost 70º, so that their target would be only the horizontal section, perhaps ten metres square. The probability of hitting was negligible; but for a flat trajectory the target was an easy one. I discussed the pros and cons at headquarters of the Fourth Army, in the presence of a representative of General Headquarters,

but to no purpose. To all my objections the answer was, "they surely can't miss such a huge target." I finally offered, if there were no 15-cm. rifles available, to run a heavy field howitzer into the front lines during the night, and destroy the tower at daybreak, with the heaviest charge and flat trajectory, at a range of 2000 metres; but the orders for the 42-cm. mortar stood.

The ammunition allotted for this purpose was 200 rounds. Instead of giving it to me without reservation, so that I could fire it all on a day when conditions were favorable, the division to which I was attached gave it out ten or twenty rounds at a time, over a period of several weeks. I had to fire a few rounds a day at the tower, along with other firing, even some of it into invisible areas, where battery positions were noted on the very bad maps. My continued protests against this waste of ammunition accomplished nothing except to get me disliked by the division commander and the chief of artillery. I might have accomplished something by a little trickery, saving a few rounds on one day and expending it on another; but the artillery commander sometimes counted my shots. Finally the chief munitions officer put a stop to this useless shooting. A year later a battery of 15-cm. Navy rifles knocked down the tower in a few rounds, which might just as well have been done in February of 1915.

Other batteries fared no better. Scharf's battery, near Arras, had to fire its precious ammunition at the supports of the aerial cableways of the mines, because there were supposed to observers up there. All of which emphasizes the necessity of having first-class artillery advisers at all higher headquarters.

In contrast to these cases of overestimating the 42-cm. mortar, there were also cases of underestimation. Some of these errors have crept even into official documents. In Volume 1 of the "Battles of the World War," published by the National Archives, I read that the two 15-cm. armored turrets of Fort Koningshoykt were still serviceable after the bombardment. This is not the case. I conducted this fire from an advanced infantry post close to the left shoulder angle of the work, so that I was as well placed to see as the observers at the targets on the Kummersdorf firing ground. Both the 15-cm. turrets fired very actively at first. Just as our own regulations prescribe, the turrets were turned with muzzle to the rear after each shot. Just after one of the turrets had fired, one of our projectiles burst in front of it; this turret never moved again. The second turret continued its fire a short time after this, and then was put out of action in the same way.

Inspection after the capture of the fort showed that both turrets were jammed by injuries to the concrete work. Repair by the troops proved impossible. Later on, I inspected all the Antwerp works in company with one of Krupps' representatives, who was in

charge of repairs; his employes had to work for days to get these turrets in action again. The writer who speaks of the ineffectiveness of the 42-cm. shells at Antwerp evidently did not see these works until the repairs were well under way. Considering the use that was afterward made of Antwerp as a German fortress, I think the way in which these guns were put out was better than the direct hit, such as described above in connection with Fort Wavre St. Catherine, where the turret was put permanently out of commission.

The attacks on the Belgian fortresses were at the pinnacle of the fame of our 42-cm. mortars. They were used to good purpose later, as against the Russian fortresses in 1915 and before Verdun in 1916. But as the trench lines became more extended and shallower, and better concealed, their effect diminished. Finally they were withdrawn from the front and their crews assigned to other guns.

Here I might make mention of the Austrian 30.5-cm. mortars, which so quickly gained a high reputation. I have seen these mortars on the march and in action, and found them astonishingly well designed and constructed for transport. In firing position, however, if the ground is not exceptionally firm, they have a tendency to get out of level, and fire has to be suspended for repairs. The shell effect is inadequate; at Fort Koningshoykt, for instance, after two days' fire from four of these mortars, the concrete work was not materially injured and the turrets were intact. A few hours of fire from my battery put the work entirely out of action. But in mythology the Austrian mortars have been very much played up, to the prejudice of ours. For instance, in the winter of 1914-15 a set of drawings was placed in the Schönbrunn palace, representing the work of the Austrian mortars. In the spring of 1915 these were reproduced in colors, and issued in a very fine portfolio form, under the title, I think, of "Our Motor-drawn Mortars in Belgium." Among these I was astonished to find several excellent sketches of 42-cm. shell craters. I was told of a similar incident in Russia in 1915.

The 42-cm. mortar was a wonderful tool. Even a poor workman could use it with effect. We who commanded batteries of them will always recall our experiences with pride and satisfaction. In 1914 and 1915, both east and west, they made a unique and decisive contribution to the victories of our incomparable infantry.